SAMPLE MATERIAL

Lesson Plan: Cupcake Geology

Chamberlin Hill Intermediate School, Ohio

Topic: How to Organize Your Teaching

Practice: Abstract-Concrete Connections

Deb Wickerham, a teacher at Chamberlin Hill Intermediate School, used this lesson plan in her featured lesson on "Cupcake Geology." Included are a rationale for the lesson, specific materials needed, and student handouts. Students are asked to make connections between the abstract concept of geological time and the concrete representation of core layers by considering types of geological processes.

CUPCAKE GEOLOGY TEACHER'S NOTES

The following hands-on activity is designed to give students the opportunity to use their critical thinking skills as they learn about taking core samples.

Preparing for the lesson:

1. Each student will need a napkin or paper towel, 5 extra thick, clear plastic straws (these can be straws that have been cut in half), a cupcake, a plastic knife (at least one per group), a copy of the cupcake geology packet

2. Prepare enough cupcakes so each student has their own, using the following steps:

- **Place foil cups in the muffin pans. Be sure to use foil cups so students cannot see through them.**
- **Prepare two boxes of white cake mix batter according to package directions.**
- **Divide the batter equally into three bowls. Add a few drops of food coloring to create three contrasting colors. You may wish to add flavor extracts, such as peppermint and orange.**
- **Layer each color of batter in the foil cups that you placed in the muffin pans. Be sure each cupcake has three layers. Then bake the cupcakes according to the package.**
- **Be sure that you do NOT frost the cupcakes or use chocolate chips, sprinkles, etc. These will get stuck in the straws when the students try to take their "core samples".**

Teaching the lesson:

- **Discuss the processes that change the Earth over time. Read aloud, or have groups read independently, the passage about Earth changing processes. Key words are shown in italics.**

CUPCAKE GEOLOGY

Natural forces shape the layers of the Earth's crust. By studying the layers of the Earth, geologists can determine what natural forces created those layers. One way geologists learn about the various layers of the Earth is by taking core samples in a region. This allows them to make a reasonable prediction about the land underneath the surface.

Two major processes are continually occurring on the Earth - those that wear down the surface and those that change and/or build up the Earth's surface. Wearing down processes include ***weathering*** and ***erosion***. Exposed surfaces are continually changed by environmental forces such as water, wind, temperature changes, pollution, etc. In many cases, large formations of rock are broken down into smaller materials and particles. Erosion, usually in the form of moving water, then transports these materials and particles to different areas where they accumulate as layers of ***sediment***.

Over millions of years, huge layers of sediment often accumulate. The weight of the top layers force the bottom layers to compress into rocks. Over time there are a variety of sediments moved by erosion. As a result, many types of rocks and sedimentary layers are formed. If these layers remain undisturbed, they will be found in horizontal bands with the oldest rocks on the bottom and the youngest rocks on the top. Using the ages of these layers is known as ***relative dating***.

However, changes can and do occur in these layers. Forces within the Earth might push the layers upward and create hills, called ***anticlines***, or they might make valleys or troughs, called ***synclines***. In other situations, forces within the Earth cause huge cracks in the sedimentary layers and allow large blocks of these layers to move vertically or laterally with relation to one another. These cracks are called ***faults***. It is along these fault lines that ***magma***, which is found deeper within the Earth, moves upward into the layers of the sediment. Sometimes the magma reaches the earth's surface and becomes the ***lava*** from volcanic eruptions. At other times, the magma cools within the sedimentary layers, forming large masses of ***igneous rock***. Therefore, determining the age of rocks is not always as simple as labeling the bottom layer as the oldest and the top layer as the youngest.

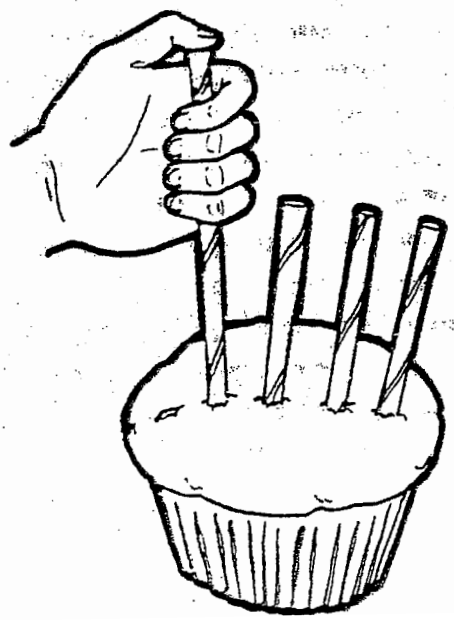
BE A CUPCAKE GEOLOGIST

Materials per student: one cupcake, one napkin, five thick, clear plastic straws, a plastic knife, colored pencils

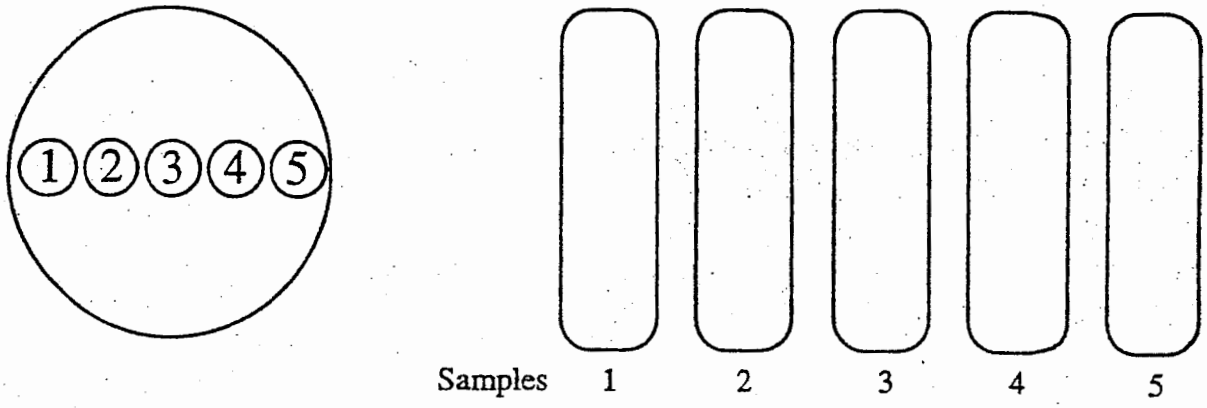
Pretend that you are a geologists. You will be taking "core samples" from an imaginary region to discover the geological forces that have occurred over time. You will be using cupcakes to represent the region. You will be allowed to eat the cupcakes only after the activity has been completed.

1. Inspect the top of you cupcake. Be sure you do not poke or peel it! Draw a cross-section to show what you think the layers inside the cupcake look like.

Directions for taking "core samples":
Push the straws into the middle of the cupcake in the positions shown in step 2. Then pull out each straw by placing your thumb over the top of the straw and gently pulling it. The "core samples" are in the straws.



2. Use your straws to take five "core samples" from the middle of your cupcake as shown below. Color the layers as they appear in your straws.



3. What new information did you learn from your "core samples" that you did not know in step 1?

CHECKPOINT

4. Now based on your five "core samples" draw a cross-section of what you think your cupcake looks like.

5. Use the plastic knife to cut your cupcake in half. Compare your last prediction to the actual layers inside. Now draw what the layers really look like.

6. Were you surprised by any of your findings? Why?

Enjoy eating you cupcake while you answer the following questions:

1. How is taking core samples better that just looking at the surface to predict what the layers of the Earth are like?

2. Who might take core samples as part of their job?

3. What are the limitations of using core samples as a means to predict what the layers under the surface are like?

4. What types of geological processes might have taken place in your imaginary region to cause the layers to appear as they did? Explain why you think these might have taken place.

CLASS CHECKPOINT